Menlo Park Notebook #189 [N-80-00-04]

This is one of six notebooks that were probably begun on January 10, 1881. It contains essays and notes by Edward H. Johnson on gas and electric lighting and on the nature of technological innovation, which appear to be related to Edison's proposed book on electric light and power. (See Menlo Park Notebook #184.) The book contains 284 numbered pages.

Blank pages not filmed: 32-33, 38-39, 56-284.

Rule for determining approximately - the No. of Gas jets required in a given room

The floor area in feet divided by 50 for Common Gas (or by 70 for Coaned Gas) will give the No. of burners required for effective lighting

Example

Room 80 × 56 = are 4480

$\frac{4480}{50}$ = 90 burners

or

$\frac{4480}{70}$ = Say 60 "

Gas first put in practical operation by Robt Murdoch of Redruth, Cornwall, publicly showed the system in 1797 — in 1798 made an effective use of the manufd gas and lighted his neighbouring workshops & factories

Opposition to Railroads

Chs. Abbot Cyclopaedia

Stephenson

"While this road was building the most eminent Engineers persisted in recommending Stationary Engines in place of Locomotives which they declared unsafe, impossible of obtaining High Speed; and the clumsy expedient of a series of Stationary machines 1½ m apart dragging the trains by ropes would have been adopted but for the energy of Stephenson and a few of his friends."

Gas

~~"A Tribute~~

"Coal Gas Treatise

~~"In~~

"In our narrative thus far we have described the 1st Ideas respecting gases; the primitive bases of Pneumatic chemistry; the earliest recorded productions of inflammable air; the spontaneous Emission of Carburetted Hydrogen from the earth & its ignition! The transport of the same Gas, together with the means of storing it, and on a small scale as a scientific curiosity, its application to lighting. All these had been observed or achieved but there was still wanting the mind to conceive the mode of applying Coal Gas to useful purposes

And the intelligence to carry it to a successful issue.

Here then as an analogy

also from some paper in the preceding Paragraph the following:

"We now pass from the visionary to the real and from the speculative to the positive"

Information ~~[illegible]~~

Work lighted with Gas in 1834 – Phil 1835 =

Phil = Gas works 1880 Valued at £5.000.000. Could not be replaced for much less =

45th annual report Trustees Phil Gas works

Mins "Examine Sewer for Gas Mains" –

With ordinary burners instead of getting 15 Candle light from Cannel Gas, 5 or 6 – Candles is the rule. In Glasgow where the Gas is exceptionally good 5 or 6 Candles is the rule, instead

of the 27 candles at which the Gas is supplied & instead of the 20 candles that can easily be obtained, the light of the gas would be the greater, due to the care required & thus it is as to get all the light out of it without producing smoke."

further

"In some cases Gas is abandoned altogether and replaced by candles & oil lamps because the simple rules for its proper burning have not been understood."

further

"As the barometer falls the light diminishes and according to Dr Frankland at the rate of 5.1 per cent for every inch of fall according to Dr Letheby in London, the difference in the value of the light when the Barometer is 31 as compared with what it is at 28 is fully 25 per cent"

~~Gas~~ Thus we have, ~~artificial~~ light ~~gas~~, ~~water~~ ~~&~~ reduced by atmospheric

Change. This may be said ~~the same~~ of ~~any other lamps of artificial~~ ~~light~~ ~~except~~ light in vacuum ~~electric light~~

further

"Practical Speaking When Compared with Wax or Patent Candles, placed on a Table of least 50 ft. of the Standard Candle power of the Gas should be deducted of to allow for the loss by burners and globes & height from Table."

Note No loss in Electric Light by defective burners - No loss by filtering through Glass Globes - because not necessary, & no Globes there is absolutely no movement of the light as when a Gas jet is

disturbed by the air - or When the pressure is such as to cause it to "blow" = These defects in Gas render it so painful to the Eye that their concealment by some translucent Glass is resorted to with the result of above loss of light

As to height from Table the E. L. may be used on the ceiling plane of the Eye which it is so mild & steady as not to be painful

Jeans on Steel

Besseemes Knowledge of
Iron Metallurgy was at
that time very limited
but his was a great adv.
to him for he had but very
little to unlearn & much
time after wards the subject
was from a beans ch. of
of those who have gone
followed a beaten track
& vainly endeavored to
get out of the Rut.

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Note

This may be said of
Edison ~~which~~ in respect
to the ~~subject~~ his Knowledge

Of the Subject of Electric Lighting at the Time I began this Investigation - the Lad never gave the Subject a moment's thought or consideration - he had not read any of the Works of the Outside Gas was in fact perfect. ~~[illegible]~~ Unbiased to follow the Course suggested by his own Mind.

Mr Sons Common Sense

following a table designed to show that Gas is less injurious than Oil Wax or Tallow is this Qualification

"No doubt these results are correct enough but they are Laboratory Experiments and when we apply the quantities to actual practice they show that Gas as burnt in the usual extravagant manner is more injurious than any of the other systems of lighting."

The Extravagant use of the Edin L. can in no way ~~[illegible]~~ create a deleterious

Effect – since none
exists primarily –

fourth.

"Gravis not to argue that
the quantity of sulphur compounds
produced at one burning is
inconsiderable since if
this quantity be not removed
and it becomes deposited on
articles in the room – it
is only a question of time
and number of repetitions
for the insignificant quantities
to become serious & formidable
collectively."

That gas does injuriously
affect Plant, ~~[illegible]~~
Paintings & decorations

is well settled – hence
although as above suggested
the injury may be very
small at any one period
of time – the cumulative
effect is very great –

The E.L. not only cannot
cause any such deposit
– but in the case of Plants
held by certain authorities to be
decidedly advantageous

~~[illegible]~~

Loss of Illuminating Power

Coal Gas is depreciated in illuminating power to a greater or less ~~extent~~ degree in working through the mains & service pipes, owing to the liability, especially in cold weather, of the Hydro-Carbons to be condensed & deposited.

New Riggings Hand Work

~~Using~~ High initial pressure synonymous with a heavy leakage &c

Note on Opposition of fraternity - professional

The opposition manifested, the fact that the highest authorities in any given art are so often found condemning most vehemently the infant innovation may be explained in this way - Naturally, he who becomes the most thoroughly versed in an existing method, who is the most firm believer in it - who has the most thoroughly mastered the principles, matter its details - is vested by his fellows with the honor of "authority" = The very firmness with which he becomes welded to the existing order of things closes his mind against innovation - he has run so long in a given groove - that

Opposition

J. S. Jeans' History of Steel

Ref. to Bessemer's Efforts to interest Iron manufrs in his new method of making steel =

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"One of the most pronounced deaidedly on Bessemer's claims was Charles Sanderson perhaps the most eminent steel manufr in Sheffield and at that time a leading authority on all questions relating to the practical manufacture of steel. Sanderson freely admitted that if Bessemer's pretensions could be realized

his invention would take
rank deservedly among the first
if not in very first of the age.
but after carefully examining
the claims of the inventor he
would not admit them to be
feasible. He did unhesitatingly
allow that by his Bessemer
process a decarburized cast
iron was attained and that
such iron was bright white
and crystalline; but he did
not believe that such metal
would admit either of being
drawn under a hammer
or rolled into a bar.
He could not admit the
Bessemer metal to be
cast steel. It would not
make a boring tool or
a cutter, a tap or a die
it could not be fashioned

by the workmans hammer
made into a needle or cut
into a file; and in short he
was compelled to express the
opinion that it was a metal
which could not assume
the commercial value of
steel. Nor would it produce
a malleable iron suited to
the requirements of commerce.

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Truran, whose experience
of the metallurgy of iron
caused his views to be
accepted with deference,
also took up the controversy
He pointed out that the
assimilation of ~~[illegible]~~ ~~[illegible]~~
the carbon in fluid iron
run direct from
~~the~~ blast furnace
and exposed to the

action of a blast of atmospheric air was no new discovery, numerous examples of blast were blown into the liquid iron in the old form of refinery furnaces and the intense heat produced by blowing oxygen into liquid iron forming carbon or mixture or combination was well known to intelligent refiners, so that Bessemer's "assumed discovery" of a great principle resolved into the republication of facts that had previously been well known."

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[from Page 18]

he cannot get out of it.

Again - Man is always loth to give up authority - hence rather than wish to find good in the new thing & thus invest another with a vestige of his authority he comes to it with a feeling of antagonism which only absolute conviction can remove - This conviction can seldom be effected in the early stages of an invention. Consequently 9 times out of 10 the "authority" fails to see what others with probably less repute but without bias at once comprehend.

~~[illegible]~~

~~Yet~~ Again It not infrequently happens that the "architect" has been seeking himself to accomplish the same thing but has only in part succeeded - He is then even more than any other man liable to ~~[illegible]~~ find in the solution offered him numerous defects, obscurities etc.

It is an even question whether an Engineer in another but kindred profession is not a more reliable judge of the value of the new thing - than one

~~[illegible]~~ of the same profession ~~to~~ illustrate - would probably be a Gas Engineer ~~&~~ ~~a~~ more competent ~~[illegible]~~ ~~to~~ pass upon the value of a system of Electric Lighting than would ~~be~~ an Electrician & vice versa -

Opposition

From the Inaugural address of the President of the British Assn. of Gas Managers at Bristol Eng. ~~Aug~~ June 12th/77 as reported in the Amer Gas Light Journal Aug 2/77 -

Under the head of "The Electric Candle" a report is given of the failure of an Exhibit of Electric Lighting to which the President had been invited because of the "breaking down of a Steam Engine without

(Publish 4/06)

which the Electric Generator could not be worked, but ~~from this the following deductions are drawn~~ ~~He says~~ :- He says: "Under all which, its cost must be such as to put it out of the question, its accuracy a Ring to Coal Gas burner from means be adopted for collecting Electricity, instead of having to employ steam power for its generation" And again in speaking of the same attempt to exhibit the light. He says "assuming however that the thing

had been a success its superiority over other Electrical lights would have been a matter of degree. The inconvenience of a light too powerful for the human eye would still remain, & the light from one burner would be found to be reduced by shading to about 15 of its power to render it admissable for the ordinary purposes of life thus reducing its value while the cost of production would remain the same. It is thus obvious that if the light of

100 candles be produced & 20 only are available the 80 are absorbed and wasted. And these would always remain the fatal objection of it not being dispensable, beside all which its cost must be such, as to put out of the question its becoming a rival to Gas Gas until some means be devised for "collecting Electricity instead of having to employ steam power for its generation."

And from this exposition of the subject as it appears to him the following deductions

40 to 70
40

from Page 22

Page 56 Bessemer

as indicative of the reaching ~~of~~ that the Bessemer process met with at the hands of the industrial Press. We may quote a short Extract from the "Pittsburgh Manufacturer" journal which asked of those who "Want something like a marvel" "Just look at the drop as refined according to the New process the new find consists of an agglutinated mass of large brilliant crystalline grains possessed of a very perfect malleability - flattening under the blow of a hammer but almost invariably

Cracking at the Edges - It is wholly destitute of a fibrous ~~structure~~ structure and only after having been repeatedly heated and drawn out in a smiths forge exhibits the properties of an inferior wrought Iron

$ £

Water vs. Coal Gas

~~Again~~

The hope is held out to the Public that a cheaper & superior Gas is to be produced by new processes. but on reference to the general discussion of the subject of the merits & demerits of the two Plates it is found that the new Gas has two fatal defects ~~first~~ viz: It is a blood poison & by being dependent upon the use of naphtha - of which

There is a Common Law but a limited Capacity - the extent to which it may be manufactured is far within the present limit of Coal as manufactured

are drawn -

"But I think I may safely say that there is not the slightest probability of property invested in Gas undertakings being affected in value by any kind of Electric Light; and that the fear of any such result can only be seriously entertained by the ignorant".

Comments:

It thus appears that the most prominent of British Gas Engineers is found indulging in captious criticisms and hurling the terrible charge of ignorance at those who entertain opinions not in accordance with his: He must indeed be a superficial thinker if he really believed the inability of the Electricity was fatal to its use - Did he not know that the large engines of a steamship work unceasingly for weeks at a time during an ocean passage - ~~He~~ ~~If then~~ If upon the Eve receiving wave now

much more constant
upon a solid foundation
~~that~~ and did it
not occur to him
that an Electric light
station might be
supplied by a member
of Engines as ~~well~~ gas
~~that~~ with
a Reservoir of Reservoirs
so that when any one
became unavailable
another might be
drawn upon - In point
of fact the assumed
insurmountable difficulty
is fully met by the
simple & natural Expedient
of having one Extra
Engine in a station
~~the supply~~ of 12 -

If one should fail
the Extra being always
kept in motion could
be so instantaneously
"switched" into connection
with the circuit mains
as to secure the result
of the lights ~~supplied~~
of such circuit becoming
more than a few
candles lower in
intensity. If a second
or a third should fail
simultaneously ~~and~~
~~the~~ the first the 9
remaining would still
suffice as much
as they would, ~~if~~
~~[illegible]~~ always
have a reserve capacity

Equal to such Extra
Strain. & Even if not
fully Equal to the Task
the deficiency would
only appear in a slight
diminishing of Each light
so slight in fact that
it would escape the
notice of at least 90 %
of the consumers, but
inasmuch as the power
at any station would
always be Equal to
the demand at that
~~hour~~ of the night
season of the year when
the maximum generation
of Light is used. the
~~Secondary~~ breakdown
~~of 13 engines~~
would, to say seriously

the power have to
occur at precisely that season
~~such a time~~
-a combination of
improbabilities ~~which~~ ~~and~~
~~slight results of so~~
~~slight~~ ~~pregnant with~~
~~a slight~~ results of
little import as to
hardly merit a moments
thought - much less
to be magnified into
a "fatal defeat." —

In confirmation of
this - attention is called
to the rapid substituting
of the old Reservoir System
of Water Supply - by the
direct supply maintained
by Steam Engines - more

than

Get Hall, Water work Statistics

Pressure Regulation

Am. Gas Journal
Sept 3/77

In a paper contributed to the meeting of the B.A. of Gas managers, Mr W. J. Warner of South Shields gives some interesting data on the subject of regulating the pressure of gas so as to secure uniformity throughout the service - and then presents some recommendations in respect to a remedy. He shows the pressure throughout the District or town is determined by the topography of

The district - It is a
matter of such common
occurrence as to come
within the observation
of almost every consumer
having to do with high
buildings that the pressure
is greater at the top
than at the bottom of
such buildings; besides
these causes of difference
due to differences of
Elevation etc there is
that of stoppage by
Naphtalin.
To determine these differences
of pressures Mr Warner
would take the pressure
"at these positions where
the mains are diminished,
at the foot, top & up
the sides of hills,

along the principal
streets and at the extreme
Ends of the districts"
The Press of the occasion
Endorsed & emphasized
Mr Warners remarks on
the subject in the following
words "Mr Warner had
dealt with a most difficult
Subject - He had been
personally acquainted with
many Companies in which
a half dividend had been
wasted for want of such
simple means as Mr
Warner had indicated
& the waste which constantly
occurred for want of due
regulation of pressure at
different parts of a Dist.
Was most serious.
In some places there
would be perhaps 3 or 4

times as much as was wanted while in others there would be a deficiency, the constant source of complaint & annoyance" =

All this is of course due to the fact that Gas is lighter than air ~~& consequently~~ rises with a pressure proportioned to the ~~length~~ ~~of the column~~ ~~the~~ ~~out of the~~ ~~to~~ height of the Column & since this varies with the topography of the dish, it follows that ~~in~~ Each dish must be considered by itself

in any attempt to Establish uniformity.

~~Although it seemed~~ with an initial pressure of 20 inches the pressure ~~the~~ ~~they~~ at various points throughout the Dist may vary ~~to~~ several inches

~~Much~~ much has been said about the difficulty of providing ~~the~~ the ~~Electric light Co~~ with a practical regulator ~~to keep the~~ ~~the~~ ~~Electric Current~~ ~~of the~~ ~~Current~~ the inventor of the Lamp & the development of the Edison System has so completely removed the matter from the

~~Sphere of Importance is~~ ~~has~~ The providing of a practical Regulator for the Electric Light has always been held to be of almost as vital importance as the invention of the lamp. Yet we ~~[illegible]~~ find ~~the~~ by the invention of the Lamp and the practical development of the Edison System the matter is taken from this sphere of importance & reduced to such simplicity & efficiency as to be absolutely free from even a single one of the

defects of gas is about depicted - Electricity not being affected by ~~the [illegible]~~ Elevation or Kindred influences ~~and having in fact no retarding~~ and being subject to no other retarding or accelerating influences than the simple resistance of the conducting wires the pressure may be wholly & absolutely regulated & controlled at the Central Station - that this is so, and that any change of pressure at the Central Station produces a corresponding

Variation at Every point of the Supply mains may readily be proven to the satisfaction of any one, however unprofessional he may be, by observing any one or more of the 800 Lamps in operation at Menlo Park. The variation will be exactly the same in the Lamps on the Tops, Sides or at the bottom of a Hill - each equally in the nearest or most distant Lamp -

~~[illegible]~~

From this it ~~[illegible]~~ follows of course that the pressure on the Lamps located

on the ground floor will be no more & no less than that on those at the highest point in the House